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the caution which is necessary in endeavouring to derive the epochs of the decennial period from the magnitude of the diurnal range of the declination-magnet, and the preference due to the variation in the amount of the disturbances in different years.

January 14, 1864.

Major-General SABINE, President, in the Chair.

The following communications were read:—

- I. "Examination of *Rubia munjista*, the East-Indian Madder, or Munjeet of Commerce." By JOHN STENHOUSE, LL.D., F.R.S.
Received December 21, 1863.

(Abstract.)

As a portion of this paper has already appeared in the 'Proceedings,' vol. xii. p. 633, I shall confine myself in this abstract to briefly noticing the additional observations which I have subsequently made.

By numerous analyses of munjistine crystallized out of spirits and dried at 100° C., and likewise of sublimed munjistine, I find that its formula is $C_{16}H_6O_6$. This result has been confirmed by analyses of the lead-salt, the formula of which I find to be $5(C_{16}H_6O_6), 6PbO$, exactly corresponding to the purpurine compound described by Wolff and Strecker*.

A comparison of the subjoined formula of alizarine, purpurine, and munjistine,

Alizarine	$C_{20}H_6O_6$,
Purpurine	$C_{18}H_6O_6$,
Munjistine.....	$C_{16}H_6O_6$,

indicates the very close relationship between these three substances, the only true colouring principles of the different species of madder with which we are acquainted.

Tinctorial Power of Munjeet.

From a numerous series of experiments I have just completed, I find that the garancine from munjeet has about half the tinctorial power of the garancine made from the best madder, viz. Naples roots. These, however, yield only about 30 to 33 per cent. of garancine, while munjeet, according to my friend Mr. Higgin of Manchester, yields from 52 to 55 per cent. The actual amount of colouring matter in munjeet and the best madder are very nearly the same; but the inferiority of munjeet as a dye-stuff results mainly from its containing only the comparatively feeble colouring matters purpurine and munjistine. The latter in large quantity is positively injurious; so much is this the case, that when the greater part of the munjistine is removed from munjeet-garancine by boiling water, it yields much richer shades with alumina mordants.

* Annalen der Chemie, vol. lxxv. p. 24.

Purpureine.

When purpurine is dissolved in dilute ammonia, and exposed to the air for about a month in a warm place, ammonia and water being added from time to time as they evaporate, the purpurine disappears, whilst a new colouring matter is formed, which dyes unmordanted silk and wool of a fine rose-colour, but is incapable of dyeing vegetable fabrics mordanted with alumina.

This new substance, which, from its mode of formation and physical properties, is so analogous to orceine, I have called *purpureine*. When pure, it forms fine long needles of a deep crimson colour, insoluble in dilute acids, slightly soluble in pure water, and very soluble in alcohol and in water rendered slightly alkaline. Professor Stokes has examined purpureine optically, and finds the spectrum the same in character as that of purpurine, but different in position, the bands of absorption being severally nearer to the red end.

From the analyses, purpureine seems to yield the formula $C_{66}H_{24}N_2O_{20}$.

Nitropurpurine.

When purpurine is dissolved in a small quantity of nitric acid, spec. grav. about 1.35, and heated to $100^{\circ}C$., it gives off red fumes, and on being allowed to cool, a substance separates in fine scarlet prisms, somewhat like chromate of silver, only of a brighter colour. It is quite insoluble in water, but slightly soluble in spirit; it is, however, soluble in strong nitric acid. When heated, it deflagrates. From this circumstance, and considering its mode of formation, it is evidently a nitro-substitution compound. I have therefore called it nitropurpurine.

When alizarine and munjistine are subjected, in the manner above described for purpurine, to the joint action of ammonia and oxygen, substantive colours are produced, neither of which are crystalline.

Action of Bromine on Alizarine.

When alcoholic solutions of alizarine are mixed with water, and aqueous solution of bromine added, a yellow precipitate is produced; the solution filtered from this, after expelling the spirit by heat, deposits a deep orange-coloured crystalline compound, which, from the analyses of six specimens prepared at different times, I find has the composition



Purpurine, when treated with bromine in a similar manner, does not yield a corresponding compound.

- II. "On the Magnetic Variations observed at Greenwich." By Professor WOLF of Zurich. Communicated by G. B. AIRY, F.R.S., Astronomer Royal. Received December 21, 1863.

(Translation.)

In April 1863 Professor Airy kindly communicated to me the Mean